The glue that keeps cells together

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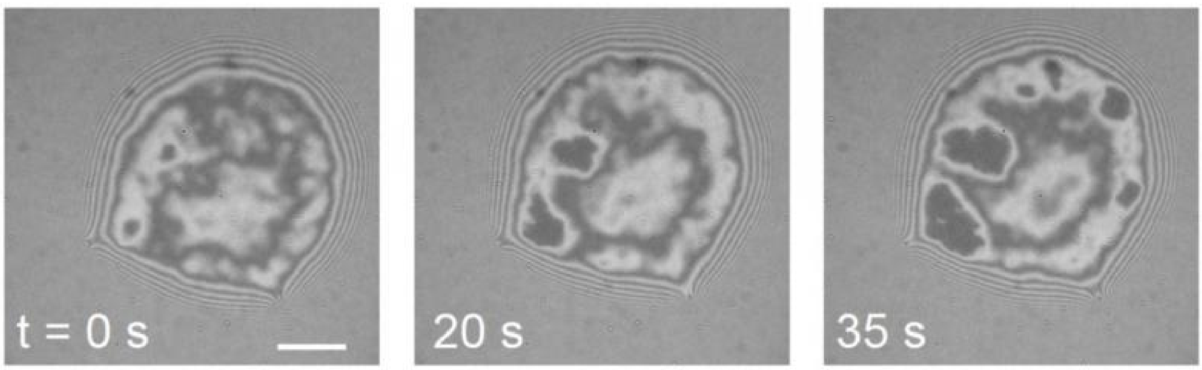

Snapshots of the bond of a giant vesicle on a plane model membrane. Dark pixels mark the points of contact between the membranes. They grow larger and more numerous over time. Credit: Susanne Fenz

Controlled adhesion and division are crucial for our body's cells. This is the case, for instance, when the organs develop in an embryo or when broken skin is repaired during the healing process.

The importance of close cell-cell adhesion becomes evident especially when it is dysfunctional, for example when cells become loose in a tumour and break free. The tumour cell complex tends to dissolve in this case and create metastases.

Cadherins as key actors

The cadherin proteins assume a central role in the above mentioned examples. Located in the cell membranes, they are capable of creating strong bonds both among themselves and with the cadherins of other cells. A bond between two cadherin molecules of two cells triggers the formation of extensive contact zones.

The process of establishing and detaching contacts seems to be much more dependent on purely physical effects than thought previously. This is shown by computer simulations and experiments published in *Nature Physics* by Dr Susanne Fenz from the University of Würzburg's Biocentre with colleagues from Jülich, Stuttgart, Erlangen and Marseilles.

Connecting model membranes

The biophysicist brought together model membranes containing cadherin and then selectively changed different physical parameters that influence the membrane's fluctuation behaviour such as the concentration of sugar and salt.

"We observed that already very small changes had a huge impact on the formation and growth of cell-cell contacts," says Dr Fenz, who leads a junior research group at the Department for Cell and Developmental Biology (Zoology I). "So it is possible to regulate a biological process by changing only physical parameters such as the temperature or local lipid composition of the membrane."

But according to Fenz, it is still doubtful to what extent the results for the model membranes can be transferred to living systems. "We will have to confirm the relevance of our observations in living systems," says Susanne Fenz.

Focus on pathogens that cause sleeping sickness

The Würzburg researcher has a general interest in the biophysics of membranes. For example, she also studies the pathogens that cause the sleeping sickness. The protozoa of the species Trypanosoma are one of Professor Markus Engstler's focal areas of research; he is the head of the Department for Zoology I at the Julius-Maximilians-Universität (JMU) in Würzburg, Germany.

What's special about the cell membrane of Trypanosoma is that it is densely populated with a protein shell that is varied continuously in a population. This high variability of the protein shell allows the pathogens to hide efficiently from the immune systems of animals and humans.

More information: Susanne F. Fenz et al. Membrane fluctuations mediate lateral interaction between cadherin bonds, *Nature Physics* (2017). DOI: 10.1038/nphys4138

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